Final Exam Prep
Non AG 2B

Key

Example Problems

Graph the function. check on calculator

1. $y = x^2 - 1$

2. $y = x^2 - 2x + 1$

3. $y = 2(x-1)^2$

4. $y = -(x+2)(x-2)$

5. $y = x^2 - 2x - 3$

6. $y = \frac{1}{2}x^2 - \frac{1}{2x} - \frac{23}{8}$

7. $y = -2(x-1)^2 + 5$

8. $y = 4(x-2)(x-4)$

9. $y = 2\sqrt{x}$

10. $y = -3\sqrt[3]{x}$

11. $y = 2\sqrt{x+2} - 2$

12. $y = \frac{1}{2}\sqrt[3]{x+3} - 1$

13. $y = -\frac{3}{2}\sqrt{x}$

14. $y = -2\sqrt{x+3} + 1$

15. $y = -\frac{2}{3}\sqrt[3]{x}$

Factor

16. $x^2 - 49$

$(x+7)(x-7)$

17. $q^2 - 11q + 24$

$(q-8)(q-3)$

18. $9v^2 - 13v + 4$

$(9v-4)(v-1)$

19. $x^4 - 81$

$(x^2+9)(x+3)(x-3)$

20. $8x^3 - 125$

$(2x-5)(4x^2+10x+25)$

21. $18x^3 - 9x^2 - 18x + 9$

$9x^2(2x-1) - 9(2x-1)$

$9(2x-1)(x+1)(x-1)$

22. $x^{2n} + 3x^n - 10$

$(x^n+5)(x^n-2)$

23. $2x^2 - 7x - 9$

$(2x-9)(x+1)$

24. $16x^3 + 250$

$2(8x^3+125)$

$2(2x+5)(4x^2-10x+25)$

Solve the quadratic equation by the indicated method.

Zero-Product Property

25. $4x^2 - 6x - 18 = 0$

$2(2x^2 - 3x - 9) = 0$

$2(2x + 3)(x - 3) = 0$

$x = -\frac{3}{2}, \quad x = 3$

26. $t^2 = 6t + 55$

$t^2 - 6t - 55 = 0$

$(t - 11)(t + 5) = 0$

$t = 11, \quad t = -5$

Square-Root

27. $3a^2 = 24$

$a^2 = 8$

$a = \pm\sqrt{8}$

$a = \pm 2\sqrt{2}$

28. $x^2 + 9 = 0$

$x^2 = -9$

$x = \pm\sqrt{-9}$

$x = \pm 3i$

Completing the Square

29. $x^2 - 6x + 5 = 0$

$x^2 - 6x + 9 = -5 + 9$

$(x - 3)^2 = 4$

$x - 3 = \pm 2$

$x = 3 \pm 2$

$x = 5, \quad x = 1$

30. $x^2 - 3x + 5 = 0$

$x^2 - 3x + \frac{9}{4} = -5 + \frac{9}{4}$

$\left(x - \frac{3}{2}\right)^2 = -\frac{11}{4}$

$x = \frac{3}{2} \pm \frac{i\sqrt{11}}{2}$

Quadratic Formula

31. $2x^2 + 6x + 5 = 0$

$a = 2 \quad b = 6 \quad c = 5$

$x = \frac{-6 \pm \sqrt{36 - 4(2)(5)}}{4}$

$x = \frac{-6 \pm \sqrt{-4}}{4}$

$x = \frac{-6 \pm 2i}{4} = \frac{-3 \pm i}{2}$

32. $x^2 + 9x = 10$

$a = 1 \quad b = 9 \quad c = -10$

$x = \frac{-9 \pm \sqrt{81 - 4(1)(-10)}}{2}$

$x = \frac{-9 \pm 11}{2}$

$x = 1, \quad x = -10$

Simplify

33. $(7 - 4i) + (8 + 6i)$

$15 + 2i$

34. $(-2 + 15i) - (8 - 3i)$

$-10 + 18i$

35. $(5 - i)(9 + 3i)$

$45 - 9i + 15i - 3i^2$

$48 + 6i$

36. $\frac{6i}{1-2i}$

$\frac{6i(1+2i)}{(1-2i)(1+2i)} =$

$= \frac{6i+12i^2}{3} = \frac{-12+6i}{3}$

$= -4+2i$

37. $\sqrt{3} \cdot 2\sqrt{3}$

6

38. $\frac{13i}{(1-2i)} \cdot \frac{(1+2i)}{(1+2i)}$

$\frac{13i+26i^2}{3}$

$\frac{-26+13i}{3}$

39. $\frac{3^{\frac{2}{3}}}{3^{-\frac{1}{3}}}$

$3^{\frac{1}{3}}$

40. $8\sqrt{8}-4\sqrt{18}$

$16\sqrt{2}-12\sqrt{2}$

$4\sqrt{2}$

41. $y^2 \cdot y^{\frac{3}{4}}$

$y^{\frac{11}{4}}$

42. $x^{15} \cdot x^{20}$

x^{35}

43. $\left(\frac{363x^{\frac{1}{6}}}{9^{\frac{1}{12}}}\right)^3$

$\frac{363^3 x^{\frac{1}{2}}}{9^{\frac{1}{4}}}$

44. $3\sqrt{28}-\sqrt{63}$

$6\sqrt{7}-3\sqrt{7}$

$3\sqrt{7}$

45. $\sqrt{\frac{32x^5}{27x^3}}$

$4x\frac{\sqrt{2}\sqrt{3}}{3\sqrt{3}\sqrt{3}}$

$\frac{4x\sqrt{6}}{9}$

46. $\left(\left(\frac{2x^{\frac{11}{6}}}{x^{\frac{4}{3}}}\right)^2\right)^3$

$\frac{2^6 x^{11}}{x^8}$

$64x^3$

47. $\frac{6\sqrt{x^2}\sqrt{x^2}}{81\sqrt{x^{16}}}$

$\frac{3x^2}{27x^8}$

$= \frac{3}{27x^6}$

Solve. Check for extraneous solutions.

48. $4 = \sqrt[3]{2x-8}$

$64 = 2x-8$

$72 = 2x$

$36 = x$

$4 = \sqrt[3]{72-8}$

$4 = \sqrt[3]{64}$

$4 = 4$ ✓

49. $(x^2-1)^{\frac{2}{3}}+2=6$

$\left[(x^2-1)^{\frac{2}{3}}\right]^{\frac{3}{2}} = (4)^{\frac{3}{2}}$

$x^2-1=8$

$x^2=9$

$x=\pm 3$

$x=3$ ✓

$(9-1)^{\frac{2}{3}}+2=6$

$4+2=6$

$x=-3$ ✓

$(9-1)^{\frac{2}{3}}+2=6$

$x=-8$ ✗
$-8+2=\sqrt{28+8}$
$-6=\sqrt{36}$

50. $x+2=\sqrt{28-x}$

$x^2+4x+4=28-x$
$-28 \quad +x$

$x^2+5x-24=0$
$(x+8)(x-3)=0$
$x=-8, \quad x=3$

$x=3$ ✓
$3+2=\sqrt{28-3}$
$5=5$

51. $\sqrt{3x+5}=\sqrt{4x-2}$

$3x+5=4x-2$
$-7=x$
$\sqrt{-16} \quad \sqrt{-14}$

no solution

53. $\sqrt[3]{-8x^3}=16$

$-8x^3=4096$
$x^3=-512$
$x=-8$ ✓

$\sqrt[3]{4096}=16$
$16=16$ ✓

54. $\sqrt{x+13}=x+1$

$x+13=x^2+2x+1$
$0=x^2+x-12$
$0=(x+4)(x-3)$
$x=-4$ ✗ $\quad x=3$ ✓

$x=-4$ ✗
$\sqrt{9}=-3$

$x=3$ ✓
$\sqrt{16}=4$

55. $\sqrt{4x+5}=\sqrt{10x-1}-2$

$4x+5=10x-1-4\sqrt{10x-1}+4$
$-10x-3$
$-6x+2=-4\sqrt{10x-1}$
$-6x-2=4\sqrt{10x-1}$
$36x^2+24x+4=16(10x-1)$
$36x^2+24x+4=160x-16$

$36x^2-184x+20=0$
$4(9x^2-46x+5)=0$
$4(9x-1)(x-5)=0$
$x=\frac{1}{9}, \quad x=5$ ✓ ✗

56. $\frac{1}{2}(5x+7)^{\frac{2}{3}}=\frac{9}{2}$

$\left[(5x+7)^{\frac{2}{3}}\right]^{\frac{3}{2}}=(9)^{\frac{3}{2}}$
$5x+7=27$
$5x=20$
$x=4$ ✓

Perform the indicated operation and state the domain.

For #s 57-59, let $f(x)=2x^3-5$ and $g(x)=3x^2$

57. $f(x)+g(x)$

$2x^3+3x^2-5$

D: x is any real #

58. $\frac{g(x)}{f(x)}$ $\quad \frac{3x^2}{2x^3-5}$

D: x any real # $x \neq \frac{5}{2}$

59. $f(g(x))$

$=2(3x^2)^3-5$
$=2(27x^6)-5$
$=54x^6-5$
D: x any real #

For #s 60-62, let $f(x)=x^3-x^2$ and $g(x)=3-x^2$

60. $g(x)-f(x)$

$3-x^2-(x^3-x^2)$
$3-x^3$

61. $f(x)\bullet g(x)$

$(x^3-x^2)(3-x^2)$
$3x^3-x^5-3x^2+x^4$
$-x^5+x^4+3x^3-3x^2$

62. $g(f(x))$

$=3-(x^3-x^2)^2$
$=3-(x^6-2x^5+x^4)$
$=-x^6+2x^5-x^4+3$

For #s 63-65, let $f(x)=x^2+1$ $g(x)=-3x^{-\frac{1}{3}}$ and $h(x)=x^{\frac{1}{2}}$

63. $h(x)\bullet g(x)$

$= \left(x^{\frac{1}{2}}\right)\left(-3x^{-\frac{1}{3}}\right)$

$-3x^{\frac{1}{6}}$

64. $\frac{f(x)}{h(x)}$

$= \frac{\left(x^2+1\right)\left(x^{\frac{1}{2}}\right)}{x^{\frac{1}{2}}\left(x^{\frac{1}{2}}\right)}$

$= \frac{x^{\frac{5}{2}}+x^{\frac{1}{2}}}{x}$

65. $f(x)\bullet h(x)$

$= \left(x^2+1\right)\left(x^{\frac{1}{2}}\right)$

$= x^{\frac{5}{2}}+x^{\frac{1}{2}}$

For #s 66-69, let $f(x)=2x^2-x$ $g(x)=x^{-\frac{1}{2}}$ and $h(x)=\frac{x-1}{3}$

66. $g(h(x))$

$= \left(\frac{x-1}{3}\right)^{\frac{1}{2}}$

$= \frac{\sqrt{3}(x-1)}{3}$

67. $f(g(x))$

$= 2\left(x^{\frac{1}{2}}\right)^2-\left(x^{\frac{1}{2}}\right)$

$= 2x-x^{\frac{1}{2}}$

68. $h(f(x))$

$= \frac{2x^2-x-1}{3}$

Answer

69. Find the number of possible 5-card hands that contain 2 queens and 2 kings taken from a standard 52 card deck.

$_4C_2 * {}_4C_2 * {}_{44}C_1$

60. You know how to make 7 different types of cookies. You have time to make any 4 of them. How many different combinations of cookie types can you make?

$_7C_4 =$

61. Slips of paper with the numbers 1-50 are in a box. Find the probability of picking a number less then 15?

$\frac{14}{50} = \frac{7}{25}$

62. Slips of paper with the numbers 1-50 are in a box. Find the probability of picking a single digit number?

$\frac{9}{50}$

63. A certain license plate configuration has 2 letters followed by 5 digits. Assuming that digits and letters can be repeated, how many different license plates are possible?

$26 * 26 * 10 * 10 * 10 * 10 * 10 =$

64. You have 10 shirts, 5 pairs of pants and 3 pairs of shoes. How many different outfits can you make?

$10 * 5 * 3 =$

65. On his long trip to Washington, DC, Dan decides to take along 5 magazines from the 12 he recently purchased. How many different groups of magazines could Dan take on his trip?

$_{12}C_5$

66. Your book club will choose 12 books from 6 biographies, 8 historical novels, 12 romance novels, and 10 science fiction novels. How many different sets of exactly 3 biographies, 2 historical novels, 3 romance novels, and 3 science fiction novels can be chose?

bio hist rom sci fi

$_6C_3 * {}_8C_2 * {}_{12}C_3 * {}_{10}C_3$

67. What is the probability of picking from a standard deck fo 52 playing cards:

A. A red card

$P_{(red)} = \frac{26}{52} = \frac{1}{2}$

B. a face card

$P_{(face)} = \frac{12}{52} = \frac{3}{13}$

C. an ace

$P_{(Ace)} = \frac{4}{52} = \frac{1}{13}$

D. a black number card

$P_{(Blk\ Number)} = \frac{20}{52} = \frac{5}{13}$

E. two cards: one face card and one ace

$P_{(face\ \&\ Ace)} = \left(\frac{12}{52}\right)\left(\frac{4}{52}\right)$ w/ replacing

$= \left(\frac{12}{52}\right)\left(\frac{4}{51}\right)$ w/o replacing

F. two cards: a 2 and a king

$P_{(2\ \&\ K)} = \left(\frac{4}{52}\right)\left(\frac{4}{52}\right)$ w/ replacing

$= \left(\frac{4}{52}\right)\left(\frac{4}{51}\right)$ w/o replacing